REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From – To)*
28 Nov 2012	Consultative Letter	June 2012 – October 2012

4. TITLE AND SUBTITLE

Review of Electromagnetic Frequency (EMF) Safety Program for Homestead ARB, FL

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
Maj Zahid Sulaiman, TSgt Samuel Ortiz, SSgt Michael Ames

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
USAF School of Aerospace Medicine
Occupational and Environmental Health Dept/OECM
2510 Fifth St.
Wright-Patterson AFB, OH 45433-7913

8. PERFORMING ORGANIZATION REPORT NUMBER

AFRL-SA-WP-CL-2012-0066

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION / AVAILABILITY STATEMENT

Distribution A: Approved for public release; distribution is unlimited. Case Number: 88ABW-2012-6203, 28 Nov 2012

13. SUPPLEMENTARY NOTES

14. ABSTRACT

A review of the electromagnetic frequency (EMF) safety program at Homestead ARB was conducted. Additionally, a survey of two previously unassessed emitters was performed. USAFSAM personnel identified and corrected deficiencies in the existing base EMF safety program and provided training to BE personnel on the management of the program in accordance with Air Force Occupational Safety and Health Standard 48-9, *Electro-magnetic Frequency (EMF) Radiation Occupational Health Program.*

15. SUBJECT TERMS

EMF, IRSO, MPE, RF, Homestead ARB

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			SSgt Michael Ames
U	U	U	SAR	20	19b. TELEPHONE NUMBER *(include area code)*

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39.18

DEPARTMENT OF THE AIR FORCE
USAF SCHOOL OF AEROSPACE MEDICINE (AFMC)
WRIGHT-PATTERSON AFB OH

28 November 2012

MEMORANDUM FOR 482 MSG/SGPB
ATTN: MR. MICHAEL SCHMIDT
29050 CORAL SEA BLVD, BOX 16
HOMESTEAD ARB, FL 33039-1299

FROM: USAFSAM/OEC
2510 Fifth St, Area B
Wright-Patterson AFB OH 45433-7913

SUBJECT: Consultative Letter AFRL-SA-WP-CL-2012-0066, Review of Electromagnetic Frequency (EMF) Safety Program, Homestead ARB, FL

1. INTRODUCTION:

a. *Purpose:* At the request of your office, from 5-7 June 2012, personnel from the Radiation Health Consulting section (OEC) of the United States Air Force School of Aerospace Medicine (USAFSAM) completed an EMF program review for Homestead ARB, FL. USAFSAM personnel performed an EMF survey on two emitters, (1) Digital Airport Surveillance Radar-AN/GPN-30 and (2) TracStar 3.8m Ku Band Satellite system. AF Form 2759 was used to document the emitter surveys and is included as Attachments 1 and 2, respectively. In addition, USAFSAM identified and corrected deficiencies in the existing EMF emitter inventory and provided training to Bioenvironmental Engineering (BE) personnel on the management of the EMF program, in accordance with Air Force Occupational Safety and Health Standard (AFOSH Std) 48-9, *Electro-Magnetic Frequency (EMF) Radiation Occupational Health Program*. A complete bibliography can be seen in Attachment 3.

b. *Scope*: For each workplace, the following items were accomplished as part of the EMF program review:

(1) Reviewed EMF emitter specifications and operating parameters
(2) Updated emitter inventory records
(3) Surveyed new emitters and completed hazard distance calculations
(4) Provided training on EMF program management

c. *Personnel Contacted*:

(1) Installation Radiation Safety Officer (IRSO), 482 MSG/SGPB
(2) Installation Frequency Manager, 482 CS/SCOA
(3) Communications Technician, 482 CS/SCOA
(4) Command Spectrum Manager, SOCSOUTH/J6
(5) Electronic Communications Technician, SOCSOUTH/J6

d. *Equipment*:

(1) Narda NBM-520 broadband field meter, S/N A-0063, calibrated: 16 Dec 11
(2) Narda EF-5092 thermocouple probe, 300 MHz – 50 GHz, S/N 01003, calibrated: 16 Dec 11. The complete calibration certificate can be seen in Attachment 4.

2. OBSERVATION: A primary focus of this visit was to survey the AN/GPN-30, Digital Airport Surveillance Radar (DASR), which was operational but not yet used by the base. EMF measurements were taken near EMF generators and waveguides and outside all areas protected by interlocks using Narda NBM 520 and Narda EF 5092 thermocouple probe. The DASR survey yielded results at background levels by indicating typical EMF noise. Exposure in excess of the maximum permissible exposure (MPE) is unlikely given existing controls, standard practices, low average power, and short transmission duration times. The hazard evaluation and hazard controls of the AN/GPN 30 survey can be seen in Attachment 1. A full listing of hazard control codes can be seen in Attachment 5. In addition, AN/GPN-30 EMF generators and waveguide pictures can be seen in Attachment 6.

3. FINDINGS:

a. AFOSH Std 48-9. The required parameters, as defined in section 4.2.3 in AFOSH Std 48-9, were not documented for all EMF-producing emitters. In addition, several emitters were absent from the existing inventory.

b. The 125th Fighter Wing Detachment 1, Florida Air National Guard, is the tenant unit on Homestead ARB. There were several EMF emitters observed outside of their facility located on the far end of the flight line that were not in the master inventory list. In addition, the F-15 C/D, operated by the 125 FW, contains several different EMF emitters that must be added to the installation inventory.

c. U.S. Special Operations Command South (SOCSOUTH): A survey was conducted on the 3.8m Cobham TracStar Deployable trailer-mounted SATCOM system (see Attachment 2). The risk of overexposure to personnel is low; however, the present barriers employed do little to alert nearby personnel of any potential EMF hazard. In addition, SOCSOUTH maintains several UHF/VHF radios attached to several different types of antennas (see Figure 1 of Attachment 6). These emitters were documented on the emitter inventory and pose little risk to personnel due to operating time and physical locations. Work center personnel appeared knowledgeable and aware of the potential hazards when working near EMF-producing equipment. A local operating instruction was not reviewed during this survey.

d. The 93d Fighter Squadron, in conjunction with the 482 AMXS, maintains and operates the F-16 C/D aircraft. A local radio frequency (RF) protection operating instruction was reviewed and found to be adequate for the protection of maintenance personnel working on or around the aircraft. A unit point of contact, referred to in the local operating instruction as a Radiation Protection Officer, was identified, and AF 2759 forms were provided to aid in the completion of this survey.

e. U.S. Customs and Border Protection: No information was available for the U.S. Customs and Border Protection tenant organization. Aircraft could be observed taking off and landing from the installation. Mr. Schmidt from the 482 MSG/SGPB indicated his intentions to visit the organization in the near future.

f. U.S. Coast Guard Maritime Safety and Security Team Miami: No information was available for the U.S. Coast Guard tenant organization. No aircraft were observed; however, small response boats could be seen in front of the facility. Low power mobile and vehicle mounted UHF/VHF radios are expected at this location.

g. The updated RF emitter inventory contains four emitters listed from the 482 MS/LGRVS. These emitters could not be verified and were obtained using a report from the base communications squadron while conducting this survey.

4. RECOMMENDATIONS:

a. The updated EMF emitter inventory should be inputted into the Defense Occupational Environmental Health Readiness System (DOEHRS) as soon as possible to comply with AFOSH Std 48-9 documentation requirements. A detailed inventory has been provided to the 482 MSG/SGPB, BE office to aid in DOEHRS data entry containing all of the required parameters. Please note that the inventory listed in Attachment 7 contains the minimum information required per AFOSH Std 48-9. Some of the EMF emitter hazard distance calculation was not accomplished because the emitter parameter was not provided or was unavailable as shown in Attachment 7. BE will complete the hazard distance calculation when the parameters are provided.

b. All EMF exposure rates in excess of the lower tier MPE require establishment of a training program. Ensure units that maintain emitters generating levels of EMF in excess of the lower tier MPEs conduct initial and refresher training for all potentially exposed personnel. Maximum permissible exposure tables can be seen in Attachment 8. Document all EMF training on AF Form 55 or equivalent.

c. SOCSOUTH is in the process of relocating all EMF emitters to a nearby location and should be resurveyed once complete. Special attention needs to be given when surveying multiple emitter environments.

d. Coordination should be made between the IRSO at the 125 FW, FL ANG, Jacksonville International Airport and the IRSO at Homestead ARB to add the necessary inventory items from the F-15 aircraft to the EMF inventory for Homestead ARB. In addition, a survey should be conducted of the 125 FW's facility on Homestead ARB to comply with training requirements in accordance with AFOSH Std 48-9.

e. Workplace visits should be conducted at the U.S. Customs and Border Protection and the U.S. Coast Guard Maritime Safety and Security Team's facilities to verify and inventory any EMF emitters, review training documentation, and identify a point of contact for annual program reviews.

f. 482 MSG/SGPB and 482 CS/SCOA need to work together to identify and inventory all EMF emitters, to include tenant organizations, on Homestead ARB.

g. The four emitters listed from the 482 MS/LGRVS should remain on the inventory until verified as transferred or otherwise not belonging to the organization. Based on the emitter inventory nomenclature, it is likely that these emitters are now listed as belonging to the Specialist Flight, 482 AMXS/MXAAS. Further investigation is necessary.

5. CONCLUSION: Upon completion of the recommendations in this report, Homestead ARB's radio frequency radiation (RFR) safety program will meet the requirements established in AFOSH Std 48-9. While the minimum requirements have been met for the host organization, additional work is needed to align the EMF safety program at Homestead ARB with its tenant organizations.

6. If you have any questions or need further information, please contact SSgt Michael Ames, DSN 798-3411, or email michael.ames@wpafb.af.mil.

Zahid M. Sulaiman

ZAHID M. SULAIMAN, Maj, USAF, BSC
Health Physics Consultant

8 Attachments:
1. AF Form 2759, Base Communications
2. AF Form 2759, USSOUTHCOM/SOCSOUTH
3. Bibliography
4. Instrument Calibration Certificates
5. RF Code Listing for AF Form 2759
6. Survey Pictures
7. Homestead ARB RFR Emitter Inventory Summary
8. Maximum Permissible Exposure Levels

Attachment 1
AF Form 2759 Base Communications

RADIOFREQUENCY EMITTER SURVEY	DATE (YYMMDD) 120703	WORKPLACE IDENTIFIER	
(Use this space for mechanical imprint)	BASE: Homestead ARB, FL	ORGANIZATION: 482 CS/SCOA	
	WORKPLACE: Base Comm		
	BLDG NO / LOCATION	ROOM / AREA	

NAME OF KEY CONTACT	GRADE	POSITION	ORGANIZATION/OFFICE SYMBOL	DUTY PHONE
		Base Spectrum Manger	482 CS/SCOA	

HAZARD EVALUATION AND CONTROL DATA

NOMENCLATURE	AN/GPN-30	AN/GPN-30		
DESCRIPTION	ASR-11 Digital Airport Surveillance Radar – Primary Surveillance	ASR-11 Digital Airport Surveillance Radar – Monopulse Secondary Surveillance		
LOCATION OF EMITTERS	Bldg 166	Bldg 166		
QUANTITY	1	1		
FREQUENCY (MHZ)	2700 – 2900 Mhz	1030 – 1090 Mhz		
PULSE WIDTH *(microsec.)*	1 µs (CW short) 89 µs (FM long)	0.8 µs		
PULSE REPITITION FREQ *(pps)*	839.5 Hz (pps)	248 Hz (pps)		
PEAK POWER *(KW)*	19.5 KW	2.0 KW		
ANTENNA CODE	OD	OD		
ANTENNA SIZE *(ft.)* *(hor./ver.)*	16.6/9	N/A		
ANTENNA BW *(deg)* *(hor./ver.)*	1.41/32	2.45/32		
ANTENNA GAIN *(dB)*	34 dBi	27 dBi		
SCANNING CODE	R	R		
SCAN RATE *(rpm)*	12.5 rpm	12.5 rpm		
ESTIMATED HAZARD DISTANCE *(ft)*	Upper Tier: 11.7 ft (T) Lower Tier: 35 ft (T)	Upper Tier: 0.18 ft (T) Lower Tier: 0.47 ft (T)		
HAZARD CODE(S)	IH, CH, SH	IH, CH, SH		
HAZARD CONTROL CODE(S)	FL, LF, WS, BA, SO	FL, LF, WS, BA, SO		
HAZARD DISTANCE MEASUREMENTS *(ft)*	N/A	N/A		

SURVEYED BY (Name, Grade, AFSC)	*REVIEWED BY (Name, Grade, AFSC)*
Michael H. Ames, SSgt, USAF, 4B071 USAFSAM/OECM	Zahid M. Sulaiman, Maj, USAF, BSC 43E3G USAFSAM/OECM

AF FORM 2759 Jan 82 COMPUTER GENERATED **PREVIOUS EDITIONS WILL BE USED**

PERIODIC CHECKS

CHECK FREQUENCY

[X] ANNUALLY [ ] QUARTERLY [ ] OTHER_____

DATE (YYMMDD)	SIGNS CURRENT	PROCEDURES ADEQUATE	OTHER	CHECKED BY (Name, Grade, AFSC)

SYSTEM DIAGRAM , CALCULATIONS AND MEASUREMENTS

PSR	MSSR
Upper Tier MPE = 90 W/m^2	**Upper Tier MPE = 34.33 W/m^2**
Lower Tier MPE = 10 W/m^2	**Lower Tier MPE = 5.15 W/m^2**
$G_{dbi} = 10^{[(dBi/10)]} = 2511.886$	$G_{dbi} = 10^{[(dBi/10)]} = 501.187$
DF = PW * PRF → DF = 89 usec * 839.5 pps * 10^{-6} = 0.074716	DF = PW * PRF → DF = 0.8 usec * 248 pps * 10^{-6} = 0.000198
P_{avg} = Pp * DF → P_{avg} = 19500 * 0.074716 = 1456.962	P_{avg} = Pp * DF → P_{avg} = 2000 * 0.0000198 = 0.397
Rotational Reduction Factor (RRF) = Horiz BW / Sector Scan Size = 1.410 / 360 = 0.004	Rotational Reduction Factor (RRF) = Horiz BW / Sector Scan Size = 2.45 / 360 = 0.007

$$D_{MPE} = \sqrt{\frac{P_{avg} \times G_{dbi} \times RRF}{4\ \pi\ MPE}}$$

$$D_{MPE} = \sqrt{\frac{1456.962 \times 2511.886 \times 0.004}{4\ \pi\ 90}} \times 3.28$$

$$D_{MPE} = \sqrt{\frac{1456.962 \times 2511.886 \times 0.004}{4\ \pi\ 10}} \times 3.28$$

$D_{MPE}(Upper\ \_Tier) =$ **11.7 ft**

$D_{MPE}(Lower\ \_Tier) =$ **35 ft**

$$D_{MPE} = \sqrt{\frac{P_{avg} \times G_{dbi} \times RRF}{4\ \pi\ MPE}}$$

$$D_{MPE} = \sqrt{\frac{0.397 \times 501.187 \times 0.007}{4\ \pi\ 34.33}} \times 3.28$$

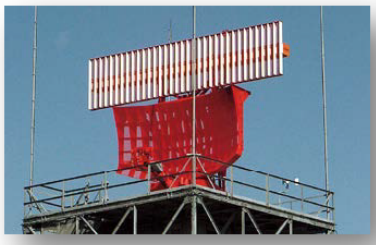
$$D_{MPE} = \sqrt{\frac{0.397 \times 501.187 \times 0.007}{4\ \pi\ 5.15}} \times 3.28$$

$D_{MPE}(Upper\ \_Tier) =$ **0.1837 ft**

$D_{MPE}(Lower\ \_Tier) =$ **0.4743 ft**

Additional Notes:

AN/GPN-30/ASR-11
Homestead ARB, FL
Fig 1



Note: ASR-11 pictured above is in radome (see fig 1)

AF FORM 2759 COMPUTER GENERATED

Attachment 2
AF Form 2759 USSOUTHCOM/SOCSOUTH

RADIOFREQUENCY EMITTER SURVEY	DATE (YYMMDD) 120822	WORKPLACE IDENTIFIER 2759.DOC 0088	
(Use this space for mechanical imprint)	BASE HOMESTEAD ARB, FL.	ORGANIZATION SOCSOUTH	
	WORKPLACE J6		
	BLDG NO / LOCATION 152	ROOM / AREA	

NAME OF KEY CONTACT	GRADE	POSITION	ORGANIZATION/OFFICE SYMBOL	DUTY PHONE
		Command Spectrum Manager	SOCSOUTH/J6	
		Electronic Communications Technician	SOCSOUTH/J6	

HAZARD EVALUATION AND CONTROL DATA

NOMENCLATURE	TracStar 3.8M Satellite Dish			
DESCRIPTION	Ku Band Satellite Dish			
LOCATION OF EMITTERS	Homestead ARB			
QUANTITY	1			
FREQUENCY (MHZ)	13750 - 14500			
PULSE WIDTH *(microsec.)*	.037			
PULSE REPITITION FREQ *(pps)*	4000			
PEAK POWER *(KW)*	.200 KW			
ANTENNA CODE	OD			
ANTENNA SIZE *(ft.)* *(hor./ver.)*	11/11			
ANTENNA BW *(deg)* *(hor./ver.)*	N/A			
ANTENNA GAIN *(dB)*	53			
SCANNING CODE	F			
SCAN RATE *(rpm)*	0			
ESTIMATED HAZARD DISTANCE *(ft)*	7.11, 22.48			
HAZARD CODE(S)	CH, SH			
HAZARD CONTROL CODE(S)	BA			
HAZARD DISTANCE MEASUREMENTS *(ft)*	N/A			

SURVEYED BY (Name, Grade, AFSC)
Michael H. Ames, SSgt, USAF, 4B071
USAFSAM/OECM

REVIEWED BY (Name, Grade, AFSC)
Zahid M. Sulaiman, Maj, USAF, BSC, 43E3G
USAFSAM/OECM

AF FORM 2759 Jan 82 COMPUTER GENERATED **PREVIOUS EDITIONS WILL BE USED**

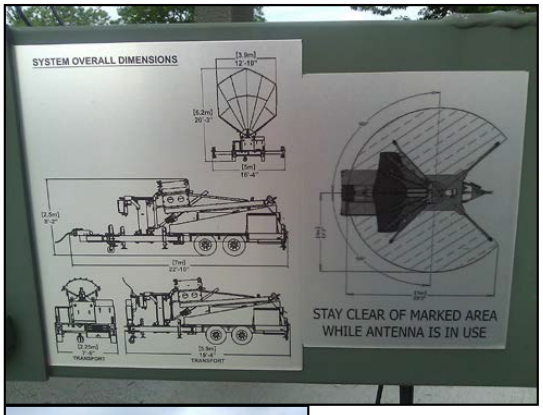
PERIODIC CHECKS

CHECK FREQUENCY

[X] ANNUALLY [ ] QUARTERLY [ ] OTHER

DATE (YYMMDD)	FINDINGS			CHECKED BY (Name, Grade, AFSC)
	SIGNS CURRENT	PROCEDURES ADEQUATE	OTHER	

SYSTEM DIAGRAM, CALCULATIONS, AND MEASUREMENTS



Theoretical Calculations
Upper Tier MPE = 100 W/m^2
Lower Tier MPE = 10 W/m^2
$G_{abs} = 10^{(gain/10)} = 199526.23$
DF = PW*PRF → DF = 0.037 usec * 4000 pps *10^{-6} = 0.000148
P_{avg} = Pp *DF → P_{avg} = 200 * 0.000148 = 0.0296
Rotational Reduction Factor (RRF) = N/A

$$D_{MPE} = \sqrt{\frac{P_{avg} \times G_{abs} \times RRF}{4\ \pi\ MPE}}$$

$$D_{MPE} = \sqrt{\frac{0.0296 \times 199526.23 \times 1}{4\ \pi\ 100}} \times 3.28$$

$$D_{MPE} = \sqrt{\frac{0.0296 \times 199526.23 \times 1}{4\ \pi\ 10}} \times 3.28$$

$D_{MPE}(Upper\_Tier) =$ **7.11 ft**

$D_{MPE}(Lower\_Tier) =$ **22.48 ft**

Attachment 3
Bibliography

Air Force radio frequency emitters inventory, located at https://gumbo2.wpafb.af.mil/portal/index.cfm; available to those with access.

Department of Defense. *Protecting Personnel from Electromagnetic Fields*, Department of Defense Instruction 6055.11, Department of Defense, Washington, DC, 19 Aug 2009.

IEEE Standards Association. *IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz*, IEEE Std C95.1-2005, IEEE, New York, NY, 19 Apr 2006.

Rademacher SE, Montgomery ND. *Base Level Management of Radio Frequency Radiation Protection Program*, AFOEHL Report 89-023RC0111DRA, Air Force Occupational and Environmental Health Laboratory, Human Systems Division, Brooks Air Force Base, TX, Apr 1989.

U.S. Air Force. *Electro-Magnetic Frequency (EMF) Radiation Occupational Health Program*, Air Force Occupational Safety Health Standard 48-9, Department of the Air Force, Washington, DC, 14 Dec 2011.

Attachment 4
Instrument Calibration Certificates

US Army Primary Standards Laboratory

Electromagnetic Standards Laboratory
AMSAM-TMD-SM
Redstone Arsenal, AL 35898-5000

Report of Calibration

for
Radiation Monitor
Narda NBM-520, S/N A-0063
with
Isotropic Probe
Narda EF-5092, S/N 01003
Submitted By
FNSY00

ACCREDITED
CALIBRATION
CERT. # 1256.01

Calibration of this device was performed under ambient conditions of 23°C ± 2°C and nominal 50 percent relative humidity. The temperature of the device was maintained constant to within 1.0 °C during the calibration. The calibration frequency was accurate to + 0.1%. The probe was immersed in an electromagnetic field with a nominal power density of 50 percent of the full-scale meter range indicated.

This device was calibrated using technique number MSL-7. Calibrations below 1 GHz were performed in a electrical characteristics of the cell and the measured net power transmitted into the cell.

At frequencies of 1 GHz and above the probe was immersed in an electromagnetic field established in an anechoic chamber facility using standard gain horns. The power density at the probe was calculated using the measured net transmitted power, the distance from the horn, and the horn gain corrected for distance. The probe was mounted on a multi-axis positioner, with the probe element centered on the horn boresight axis and the probe handle oriented parallel to the horn boresight axis.

The total estimated measurement uncertainty in Calibration Factor at the time of calibration is plus or minus 2.0 dB and rerpresents an approximate 95% (k=2) confidence level. The user should be aware that over the recommended calibration interval the reported calibration factors could change significantly within the stated uncertainty, depending on how well the probe is protected from rough usage. The user should be aware that there are many factors that may cause the item to drift out of calibration before the recommended interval has expired.

All values provided herein are traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to traceability is on file and is available for examination upon request. This calibration is accredited to ISO/IEC 17025 by the American Association for Laboratory Accreditation (A2LA Cert. No. 1256.01). This report may not be reproduced except in full without the permission of the Electromagnetic Standards Laboratory.

It should be noted that when the probe is hand-held, additional measurement errors are possible due to perturbations of the field by the probe cable and/or the operator. These errors can usually be held to 0.5 dB or less by holding the probe close to the transmitting source, as far as possible away from the operator.

Calibration Report No. A-0063/01003
Date Calibrated: 16 Dec 2011
Calibration Due: 5 Dec 2013

Page:1 of 2

AMSAM-TMD-SM
Radiation Monitor/Isotropic Probe
Narda NBM-520/Narda EF-5092
Serial No. A-0063/01003

The probe **CALIBRATION FACTOR** is a correction to be applied to the meter indication to obtain the true power density. Calibration Factor is calculated as the true power density divided by the peaked meter indication. Multiply the meter indication by the Calibration Factor to obtain the true power density.

Calibration Data Table All Values Apply to Meter Range: 1(mW/cm^2)	
Frequency (GHz)	Calibration Factor
0.3000	1.385
0.5000	1.220
0.7500	1.222
2.4500	1.490
3.0000	1.087
6.0000	0.945
9.0000	0.690
12.0000	1.063
15.0000	1.220
18.0000	1.489
26.5000	1.117
40.0000	1.635

Calibration Performed By:

Jaime R. Clayton
Senior Engineering Technician
Electromagnetic Standards Laboratory
DSN: 788-8550 Comm: 256-842-8550
E-mail: jaime.r.clayton@conus.army.mil

Calibration Reviewed By:

Brandon A. May
Electronics Engineer
Electromagnetic Standards Laboratory
DSN: 746-4961 Comm: 256-876-4961
E-mail: brandon.a.may@conus.army.mil

Calibration Report No. A-0063/01003
Date Calibrated: 16 Dec 2011
Calibration Due: 5 Dec 2013

Attachment 5
RF Code Listing for AF Form 2759

1. The following codes are used to identify the type of antenna present:

Code	Antenna Description	Code	Antenna Description
RR	Rectangular Reflector	RH	Rhombic
CR	Circular Reflector	YA	Yagi or Yagi Array
PA	Phased Array	MO	Monopole or Collinear Array
BL	Blade	DP	Dipole or Dipole Array
HC	Horn	DC	Discone
SL	Slots/Slot Array	DI	Discage
HE	Helix	ST	Stub
LE	Lens	DL	Dummy Load
WH	Whip	LO	Loop
VL	Vertical Log Periodic	OD	Other Directional
HL	Horizontal Log Periodic	OO	Other Omni directional

2. The following codes are used to identify the motion of the antenna beam:

Code	Description	Code	Description
F	Fixed	S	*Sector Scan (Mechanical)
R	Rotating, 360 degrees	E	*Sector Scan (Electronic)
T	Tracker		

Note: If "S" or "E" is used, annotate the width, in degrees, of the scanned sector

3. The following codes are to be applied next to the estimated hazard distance:

Code	Description
F	Far Field
N	Near Field Correction Applied
T	Extracted from manufacturer's data sheet or specifications
O	Other Source

4. The following codes are used to describe the hazard category:

Code	Description
NH	No levels generated in excess of the MPE
IH	Hazardous levels possible, but in normally inaccessible areas
CH	Hazardous levels possible, but only in areas that require climbing
GH	Ground level hazardous exposures possible
DL	Transmitter dummy loaded
SH	Hazardous levels possible, but transmission time is too short for overexposure
OD	Other device (non-antenna); no levels generated in excess of the MPE
OE	(non-antenna); levels generated in excess of the MPE

5. The following codes are used to describe the types of controls in place for each system:

Code	Description	Code	Description
AS	Audible Signal	CO	Constant observation when in use
FL	Flashing Light(s)	SC	Special Coordination
LF	Locked fence	SO	Standard Operating Procedures
FE	Fence	OM	Other
WS	Warning signs	NR	

Attachment 6
Survey Pictures

Figure 1: Special Operations Command South Antenna Cluster

Figure 2: Special Operations Command South Antenna Cluster

Figure 3: AN/GPN-30 Frequency Generator Waveguides

Figure 4: AN/GPN-30 Temporary Waveguides

Figure 5: Motorola Quantar Repeater

Figure 6: Joint Incident Communication Site Capability (JISCC)

Figure 7: Motorola Quantar Repeater Control Building

Attachment 7
Homestead ARB RFR Emitter Inventory Summary

Work Center	Emitter Nomenclature	Emitter Description	Quantity	Frequency Range	MPE Upper Tier/Lower Tier	[1]Hazard Distance (ft) – Upper Tier	[1]Hazard Distance (ft) – Lower Tier
482 CS/SCOA	AN/GRN 45	TACAN GND TO AIR	1	980 MHz	32.667/4.9	3.5	9.1
482 CS/SCOA	AN/GRN 30	Localizer GND TO AIR	1	109.9 MHz	10/2	20.1	45.0
482 CS/SCOA	AN/GRN 31	GLIDE GND TO AIR	1	333.8 MHz	11.27/2	8.5	20.1
482 CS/SCOA	AN/TRC-176	Radio Set Multi Channel	2	116-333.9 MHz	10/2	1.0	2.3
482 CS/SCOA	T-1108/GRT-21	Radio Set UHF Single Channel	1	250-399.9 MHz	10/2	1.8	4.1
482 CS/SCOA	T-1109/GRT-22	Radio Set VHF Single Channel	1	116-149.9 MHz	10/2	1.8	4.1
482 CS/SCOA	AN/GRC-171	Radio Set UHF Multi Channel	2	250-399.9 MHz	10/2	2.6	5.8
482 CS/SCOA	AN/GRC-211	Radio Set VHF Multi Channel	2	116-149.9 MHz	10/2	1.6	3.6
482 CS/SCOA	AN/TRC-176	Radio Set Multi Channel	2	116-333.9 MHz	10/2	1.0	2.3
482 CS/SCOA	T-1108/GRT-21	Radio Set VHF Single Channel	8	250-399.9 MHz	10/2	1.8	4.1
482 CS/SCOA	T-1109/GRT-22	Radio Set UHF Single Channel	9	116-149.9 MHz	10/2	1.8	4.1
482 CS/SCOA	AM6154/GRT-21	Radio Set UHF Single Channel	4	250-399.9 MHz	10/2	36.7	82.2
482 CS/SCOA	AM6155/GRT-22	Radio Set VHF Single Channel	2	116-149.9 MHz	10/2	36.7	82.2
482 CS/SCOA	T-5365	Quantar Repeater	10	138.3250-150.800 MHz	10/2	164.5	367.9
482 CS/SCOA	Astro Consolette	Base Station	24	138.3250-150.800 MHz	10/2	30.7	68.8
482 CS/SCOA	Astro Spectra	Mobile	51	138.3250-150.800 MHz	10/2	1.9	4.3
482 CS/SCOA	Handheld Portable	MTS2000/XTS3000/XTS5000	487	138.3250-150.800 MHz	10/2	0.9	2.0
482 CS/SCOA	AN/GPN-20	ATC Radar, Channel A	1	2800 MHz	93.34/10	5.9	18.1
482 CS/SCOA	AN/GPN-20	ATC Radar, Channel B	1	2860 MHz	95.34/10	5.8	18.1
482 CS/SCOA	AN/TPX-42	IFF Radar	1	1030 MHz	34.44/5.15	1.1	3.1
482 CS/SCOA	AN/TPX-42	IFF Transponder	1	1090 MHz	36.33/5.45	1.1	3.0
482 CS/SCOA	AN/GPN-30 (DASR)	Monopulse Remote Site Monitor (MRSM)(PARROT)	1	1090 MHz	36.33/5.45	0.2	0.5
482 CS/SCOA	AN/GPN-30 (DASR)	Monopulse Secondary Surveillance Radar (MSSR)	1	1030 MHz	34.33/5.15	0.1	0.4
482 CS/SCOA	AN/GPN-30 (DASR)	ATC Primary Surveillance Radar (PSR)	1	2700-2900 MHz	90/10	11.6	35.0
482 CS/SCOA	AN/GRT-21	Voice RAPCON, GND to Air	1	123.8 MHZ	10/2	1.3	2.9
482 CS/SCOA	AN/GRT-21	Voice Local Control, GND to Air	1	133.45 MHz	10/2	1.3	2.9
482 CS/SCOA	AN/GRT-21	Voice Rapcon, GND to Air	1	135.85 MHz	10/2	1.3	2.9
482 CS/SCOA	AN/GRT-21	Voice Guard, GND to Air	1	121.5 MHz	10/2	1.3	2.9
482 CS/SCOA	AN/GRT-21	Voice Ground Control, GND to Air	1	121.75 MHz	10/2	1.3	2.9
482 CS/SCOA	AN/GRT-21	Voice Clearance, GND to GND	1	135.125 MHz	10/2	1.3	2.9
482 CS/SCOA	AN/GRT-21	Voice ATIS, GND to Air	1	132.275 MHz	10/2	1.3	2.9
482 CS/SCOA	AN/GRT-21	Voice Rapcon, GND to Air	1	134.125 MHz	10/2	1.3	2.9
482 CS/SCOA	AN/GRT-22	Approach Voice, Control UHF, GND to Air	1	279.55 MHz	12.37/2	1.3	2.9
482 CS/SCOA	AN/GRT-22	Voice Rapcon, GND to Air	1	257.675 MHz	10/2	1.3	2.9
482 CS/SCOA	AN/GRT-22	Voice Rapcon, GND to Air	1	269.525 MHz	10.75/2	1.3	2.9
482 CS/SCOA	AN/GRT-22	Voice Approach Control, GND to Air	1	370.925 MHz	10.61/2	1.1	2.9
482 CS/SCOA	AN/GRT-22	ATIS, GND to Air	1	269.9 MHz	10/2	1.3	2.9
482 CS/SCOA	AN/GRT-22	Voice Rapcon, GND to Air	1	322.525 MHz	10/2	1.2	2.9
482 CS/SCOA	AN/GRT-22	Voice SPVR of Flying, GND to Air	1	318.2 MHz	10/2	2.8	6.5

Work Center	Emitter Nomenclature	Emitter Description	Quantity	Frequency Range	MPE Upper Tier/Lower Tier	[1]Hazard Distance (ft) – Upper Tier	[1]Hazard Distance (ft) – Lower Tier
482 CS/SCOA	AN/GRT-22	Voice Guard, GND to Air	1	243 MHz	10/2	2.9	6.5
482 CS/SCOA	AN/GRT-22	Local Voice, Control, GND to Air	1	275.8 MHz	10/2	1.3	2.9
482 CS/SCOA	AN/TRC 176	Voice 93 OPS, VHF, GND to Air	1	121.5-135.125 MHz	10/2	1.3	2.9
482 CS/SCOA	AN/TRC 176	Voice 93 OPS, UHF, GND to Air	1	243-388.8 MHz	10/2	1.3	2.9
482 CS/SCOA	AN/TRC 176	GND to GND, Command Post to OS (Voice)	1	252.125 MHz	10/2	1.3	2.9
482 CS/SCOA	AN/TRC 176	GND to GND, Command Post to OS (Voice)	1	251.2 MHz	10/2	1.3	2.9
482 CS/SCOA	AN/TRC 176	Pilot To Metro Air to GND Voice	1	318.65 MHz	10.62/2	1.2	2.9
482 CS/SCOA	AN/TRC 176	Pilot to Dispatch, Air to GND Voice	1	371.2 MHz	12.37/2	1.1	2.9
482 CS/SCOA	JISCC - Satellite	Joint Incident Site Communications Capability - Satellite Dish	1	14 GHz	10/10		
482 CS/SCOA	JISCC - Radio	Joint Incident Site Communications Capability - Radio	1	Unk	Unk		
482 CS/SCOA	JISCC - WIFI	Joint Incident Site Communications Capability - WIFI	1	Unk	Unk		
482 CS/SCOA	InMarsat	InMarsat	1	Unk	Unk		
482 CS/SCX	957J-1(V)2	Northstar Ground Entry Point (GEP)	2	225–328.6 MHz, 335.4–399.975 MHz	10/2	13.8	30.9
482 MS/LGRVS	AN/ARC-164	UHF Radio	2	399.97 MHz	13.33/2	1.2	3.2
482 MS/LGRVS	AN/ARC-186	VHF Radio	2	159.97 MHz	10/2	1.2	2.7
482 MS/LGRVS	CD AMP DET	CLASSIFIED	Classified	Classified	Classified	Classified	Classified
482 MS/LGRVS	RF Test Station	Test RF Equipment	10	18 GHz	100/10	0.1	0.3
482 AMXS/MXAAS	AN/PLM-4	Radar Frequency Simulator Test Set	2	500–18000 MHz	16.67/2.5	0.01	0.02
482 AMXS/MXAAS	AN/ARC-164	UHF Transceiver	1 per F-16	225.0-399.97 MHz	10/2	1.0	2.3
482 AMXS/MXAAS	AN/ARC-186	VHF Transmitter	1 per F-16	116.0-151.97 MHz	10/2	0.6	1.4
482 AMXS/MXAAS	AN/ASQ-177	SADL Data Link Radio - IFF/UHF Antenna, Upper	1 per F-16	420-450 MHz	10/2.1	3.2	7.1
482 AMXS/MXAAS	AN/ASQ-177	SADL Data Link Radio - IFF/UHF Antenna, Lower	1 per F-16	420-450 MHz	10/2.1	3.2	7.1
482 AMXS/MXAAS	SADL (Ground	SADL Support Equipment	1 per SSE	420-450 MHz	10/2.1	4.6	10.1
482 AMXS/MXAAS	AN/APN-232	Combined Altitude Radar Altimeter (CARA)	1 per F-16	4.2-4.2 GHz	100/10	0.8	2.4
482 AMXS/MXAAS	AN/APG 68	Fire Control Radar (FCR)	1 per F-16	Classified	Classified	Classified	Classified
482 AMXS/MXAAS	AN/ARN-118	TACAN Upper Antenna	1 per F-16	1025–1150 MHz	34.16/5.125	0.02	0.05
482 AMXS/MXAAS	AN/ARN-118	TACAN Lower Antenna	1 per F-16	1025–1150 MHz	34.16/5.125	0.02	0.05
482 AMXS/MXAAS	AN/APX-101	IFF/UHF Antenna, Lower	1 per F-16	1030-1090 MHz	36.33/5.45	0.1	0.2
482 AMXS/MXAAS	AN/APX-101	IFF/UHF Antenna, Upper	1 per F-16	1030-1090 MHz	36.33/5.45	0.1	0.2
482 AMXS/MXAAS	IFF Transponder	IFF Transponder	1 per tester	1090 MHz	36.33/5.45	1.1	2.8
482 AMXS/MXAAS	AN/ALQ-131	ECM POD	Classified	Classified	Classified	Classified	Classified
482 AMXS/MXAAS	AN/ALQ-188	ECM POD	Classified	Classified	Classified	Classified	Classified
482 AMXS/MXAAS	AN/AAQ-28	Lightning Pod	1 per F-16	4400–5850 MHz	100/10	0.5	1.8
482 AMXS/MXAAS	AN/ARC-210	IFF/UHF Antenna, Lower	1 per F-16	225-400 MHz	10/2	2.5	5.5
482 AMXS/MXAAS	AN/ARC-210	IFF/UHF Antenna, Upper	1 per F-16	225-400 MHz	10/2	2.5	5.5
482 AMXS/MXAAS	AN/ARC-210	SATCOM Antenna	1 per F-16	Unknown	Unknown		
482 AMXS/MXAAS	AN/ARC-210	VHF Antenna	1 per F-16	30-174 MHz	10/2	0.3	0.7
SOCSOUTH	AN/PRC-117F	Multi-band Radio (MBR)	4	30-512 MHz	10/2	6.5	14.6

Work Center	Emitter Nomenclature	Emitter Description	Quantity	Frequency Range	MPE Upper Tier/Lower Tier	[1]Hazard Distance (ft) – Upper Tier	[1]Hazard Distance (ft) – Lower Tier
SOCSOUTH	AN/PRC-150	High Frequency Radio	5	1.6-30 MHz	3515.625/703.125	0.28	0.6
SOCSOUTH	AN/PRC-150	High Frequency Radio	5	1.6-30 MHz	3515.625/703.125	0.2	0.5
SOCSOUTH	AN/PSC-5D	Multi-band Radio (MBR)	5	30-512 MHz	10/2	6.5	14.6
SOCSOUTH	AN/PSC-5D	Multi-band Radio (MBR)	5	30-512 MHz	10/2	6.5	14.6
SOCSOUTH	TracStar 3.8M Satellite Dish	Ku Band Satellite Dish	1	13750-14500 MHz	100/10	7.1	22.4

Note 1: Unless otherwise stated, the indicated hazard distances are based on the calculated theoretical hazard distance in feet

Attachment 8
Maximum Permissible Exposure Levels
AFOSH Std 48-9, Attachment 3, Tables A3.1 and A3.2

Table A3.1. MPEs for the Upper Tier.

A. MPE for Upper Tier				
Frequency Range (f) (MHz)	**Electric Field - rms (E)[a] (V/m)**	**Magnetic field strength - rms (H)[a] (A/m)**	**Power Density - rms (S) E-field, H-field (W/m^2)**	**Averaging time $\|E\|^2$, $\|H\|^2$ or S (min)**
0.1 - 1.0	1842	$16.3/f_M$	$(9000, 100\,000/f_M^2)$[b]	6
1.0 – 30	$1842/f$	$16.3/f_M$	$(9000/f_M^2, 100\,000/f_M^2)$	6
30 – 100	61.4	$16.3/f_M$	$(10, 100\,000/f_M^2)$	6
100 – 300	61.4	0.163	10	6
300 – 3000			$f_M/30$	6
3000 – 30 000			100	$19.63/f_G^{1.079}$
30 000 – 300 000			100	$2.524/f_G^{0.476}$
NOTE: f_M is the frequency in MHz, f_G is the frequency in GHz				
[a]For exposures that are uniform over the dimensions of the body, such as certain far-field plane-wave exposures, the exposure field strengths and power densities are compared with the MPEs in section A of this table. For non-uniform exposures, the mean values of the exposure fields, as obtained by spatially averaging the squares of the field strengths or averaging the power densities over an area equivalent to the vertical cross section of the human body (projected area), or a smaller area depending on the frequency, are compared with the MPEs in section A of this table.				
[b]These plane-wave equivalent power density values are commonly used as a convenient comparison with MPEs at higher frequencies and are displayed on some instruments in use.				

Table A3.2. MPEs for Lower Tier.

A. MPEs for Lower Tier					
Frequency Range (f) (MHz)	**rms electric field (E)[a] (V/m)**	**rms magnetic field strength (H)[a] (A/m)**	**rms power density (S) E-field, H-field (W/m^2)**	**Averaging time $\|E\|^2$, $\|H\|^2$ or S (min)**	
0.1-1.34	614	$16.3/f_M$	$(1000,100\,000/f_M^2)$[c]	6	6
1.34–3	$823.8/f_M$	$16.3/f_M$	$(1800/f_M^2, 100\,000/f_M^2)$	$f_M^2/0.3$	6
3–30	$823.8/f_M$	$16.3/f_M$	$(1800/f_M^2, 100\,000/f_M^2)$	30	6
30–100	27.5	$158.3/f_M^{1.668}$	$(2, 9\,400\,000/f_M^{3.336})$	30	$0.0636\,f_M^{1.337}$
100–400	27.5	0.0729	2	30	30
400-2000	-	-	$f_M/200$	30	
2000-5000	-	-	10	30	
5000-30 000	-	-	10	$150f_G$	
30 000-100 000	-	-	10	$25.24/f_G^{0.476}$	
100 000-300 000	-	-	$(90f_G-7000)/200$	$5048/[(9f_G-700)f_G^{0.476}]$	
NOTE: f_M is the frequency in MHz, F_G is the frequency in GHz					
[a]For exposures that are uniform over the dimensions of the body, such as certain far-field plane-wave exposures, the exposure field strengths and power densities are compared with the MPEs in section A of this table. For non-uniform exposures, the mean values of the exposure fields, as obtained by spatially averaging the squares of the field strengths or averaging the power densities over an area equivalent to the vertical cross section of the human body (projected area), or a smaller area depending on the frequency, are compared with the MPEs in section A of this table.					
[c]These plane-wave equivalent power density values are commonly used as a convenient comparison with MPEs at higher frequencies and are displayed on some instruments in use.					